I CLAIM:

1. A fuel processing system, comprising:

a sulfur-removal assembly including at least one sulfur-absorbent bed adapted to receive a stream containing a carbon-containing feedstock and sulfur compounds, wherein the bed contains a sulfur-absorbent material that is adapted to reduce the concentration of the sulfur compounds in the stream, and further wherein the sulfur-absorbent material is adapted to catalyze the conversion of carbon monoxide and water to yield hydrogen gas and carbon dioxide at temperatures less than approximately 350° C; and

a fuel processor adapted to receive a feed stream that includes the carbon-containing feedstock from the sulfur-removal assembly and to produce a product hydrogen stream containing hydrogen gas therefrom.

2. The fuel processing system of claim 1, wherein the sulfur-absorbent material is selected from a group of materials that does not catalyze the formation of methane from the carbon-containing feedstock when the bed is operated at a temperature of less than approximately 400° C.

3. The fuel processing system of claim 1, wherein the sulfur-absorbent material is selected from a group of materials that does not catalyze the formation of coke from the carbon-containing feedstock when the bed is operated at a temperature of less than approximately 400° C.

4. The fuel processing system of claim 1, wherein the sulfur-absorbent material is more reactive than zinc oxide at removing sulfur compounds from the carbon-containing feedstock at temperatures in the range of approximately 100° C and approximately 400° C.

5. The fuel processing system of claim 1, wherein the sulfur-absorbent material is adapted to absorb organic sulfur compounds.

6. The fuel processing system of claim 1, wherein the sulfur-absorbent material is selected from a group of materials that are poisoned when exposed to sulfur compounds.

7. The fuel processing system of claim 6, wherein the sulfur-absorbent material is selected from a group of materials that are poisoned when exposed to sulfur compounds present in concentrations in the range of 1-10 ppm at temperatures less than approximately 350° C.

8. The fuel processing system of claim 1, wherein the sulfur-absorbent material includes 10-90% copper oxide.

9. The fuel processing system of claim 8, wherein the sulfur-absorbent material includes 20-60% copper oxide.

10. The fuel processing system of claim 9, wherein the sulfur-absorbent material further includes zinc oxide.

11. The fuel processing system of claim 1, wherein the sulfur-absorbent material includes chromium.

12. The fuel processing system of claim 1, wherein the bed is operated at a temperature in the range of 20° C and approximately 400° C.

13. The fuel processing system of claim 12, wherein the fuel processing system includes a heating assembly adapted to heat the at least one sulfur-absorbent bed to a temperature in the range of approximately 100° C and approximately 400° C.

14. The fuel processing system of claim 1, wherein the sulfur-removal assembly includes a plurality of sulfur-absorbent beds containing the sulfur-absorbent material.

15. The fuel processing system of claim 14, wherein the sulfur-removal assembly includes a valve assembly that is adapted to selectively deliver the stream containing the carbon-containing feedstock to at least one but less than all of the sulfur-absorbent beds such that at least one of the sulfur-absorbent beds does not receive a portion of the stream containing the carbon-containing feedstock.

16. The fuel processing system of claim 1, wherein each of the sulfur-absorbent beds containing the sulfur-absorbent material has a capacity of absorbed sulfur and further wherein the fuel processing system includes at least one sensor adapted to measure the percentage of the capacity at which each of the beds is operating.

17. The fuel processing system of claim 1, wherein each of the sulfur-absorbent beds containing the sulfur-absorbent material has a capacity of absorbed sulfur, and further wherein the fuel processing system further includes a controller that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has been reached and to trigger a user-notifying event responsive thereto.

18. The fuel processing system of claim 17, wherein upon determination that a bed is operating above the threshold value, the controller is adapted to send a control signal to a user-notifying device.

19. The fuel processing system of claim 17, wherein the controller includes at least one sensor adapted to measure the percentage of each bed's capacity at which the beds are operating.

20. The fuel processing system of claim 19, wherein each of the sulfur-absorbent beds containing the sulfur-absorbent material includes a sensor in communication with the controller and adapted to measure the percentage of the bed's capacity of absorbed sulfur at which the bed is operating.

21. The fuel processing system of claim 17, wherein the controller includes a memory portion in which at least one threshold value is stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material.

22. The fuel processing system of claim 21, wherein the controller includes a memory portion in which at least a lower and a higher threshold value are stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material, and wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device.

23. The fuel processing system of claim 22, wherein the user-notifying device is adapted to produce different responses responsive to receiving the first and the second control signals.

24. The fuel processing system of claim 1, wherein the sulfur-removal assembly further includes at least one sulfur-removal region adapted to remove sulfur compounds from the carbon-containing feedstock other than with the sulfur-absorbent material.

25. The fuel processing system of claim 24, wherein the at least one sulfur-removal region is adapted to remove sulfur compounds by hydrodesulfization.

26. The fuel processing system of claim 1, wherein the carbon-containing feedstock includes at least one hydrocarbon.

27. The fuel processing system of claim 1, wherein the carbon-containing feedstock includes at least one alcohol.

28. The fuel processing system of claim 1, wherein the feed stream includes water and the fuel processor includes a reforming region with at least one reforming catalyst bed adapted to produce a stream containing hydrogen gas from the feed stream via a reforming reaction and further wherein the product hydrogen stream is formed from the stream containing hydrogen gas.

29. The fuel processing system of claim 28, wherein the stream containing hydrogen gas further includes other gases, and further wherein the fuel processor includes a separation region in which the stream containing hydrogen gas is separated into a hydrogen-rich stream containing at least substantially hydrogen gas and a byproduct stream containing at least a substantial portion of the other gases.

30. The fuel processing system of claim 29, wherein the separation region is adapted to separate the stream containing hydrogen gas into the hydrogen-rich stream and the byproduct stream via a pressure-driven separation process.

31. The fuel processing system of claim 30, wherein the separation region includes at least one hydrogen-permeable membrane positioned to be contacted by the stream containing hydrogen gas, and further wherein the hydrogen-rich stream is formed from a portion of the stream containing hydrogen gas that permeates through the membrane and the byproduct stream is formed from a portion of the stream containing hydrogen gas that does not pass through the membrane.

32. The fuel processing system of claim 31, further comprising a fuel cell stack adapted to receive at least a portion of the product hydrogen stream and to produce an electric current therefrom.

33. The fuel processing system of claim 31, wherein the at least one membrane comprises at least one of palladium and a palladium alloy.

34. The fuel processing system of claim 33, wherein the separation region includes a plurality of hydrogen-permeable membranes arranged in pairs such that each pair of membranes defines a permeate channel therebetween from which the hydrogen-rich stream is produced.

35. The fuel processing system of claim 1, further comprising a fuel cell stack adapted to receive at least a portion of the product hydrogen stream and to produce an electric current therefrom.

36. A fuel processing system, comprising:

a sulfur-removal assembly including at least one sulfur-absorbent bed adapted to receive a stream containing a carbon-containing feedstock and sulfur compounds, wherein the bed contains a sulfur-absorbent material that is adapted to reduce the concentration of the sulfur compounds in the stream, and further wherein the sulfur-absorbent material is selected from a group of materials that does not catalyze the formation of methane or coke from the carbon-containing feedstock when the bed is operated at a temperature of less than approximately 400° C, and further wherein the sulfur-absorbent material is adapted to absorb organic sulfur compounds; and

a fuel processor adapted to receive a feed stream that includes the carbon-containing feedstock from the sulfur-removal assembly and to produce a product hydrogen stream containing hydrogen gas therefrom, wherein the fuel processor includes a reforming region containing at least one reforming catalyst bed in which a mixed gas stream containing hydrogen gas and other gases is produced from a feed stream that includes the stream containing the carbon-containing feedstock and water, and further wherein the fuel processor includes a separation region in which the mixed gas stream is separated via a pressure-driven separation process into a hydrogen-rich stream containing at least substantially hydrogen gas and a byproduct stream containing at least a substantial portion of the other gases.

37. The fuel processing system of claim 36, wherein the sulfur-absorbent material is more reactive than zinc oxide at removing sulfur compounds from the carbon-containing feedstock at temperatures in the range of approximately 100° C and approximately 400° C.

38. The fuel processing system of claim 36, wherein the sulfur-absorbent material is selected from a group of materials that are poisoned when exposed to sulfur compounds.

39. The fuel processing system of claim 38, wherein the sulfur-absorbent material is selected from a group of materials that are poisoned when exposed to sulfur compounds present in concentrations in the range of 1-10 ppm at temperatures less than approximately 350° C.

40. The fuel processing system of claim 36, wherein the sulfur-absorbent material includes 10-90% copper oxide.

41. The fuel processing system of claim 40, wherein the sulfur-absorbent material includes 20-60% copper oxide.

42. The fuel processing system of claim 41, wherein the sulfur-absorbent material further includes zinc oxide.

43. The fuel processing system of claim 36, wherein the sulfur-absorbent material includes chromium.

44. The fuel processing system of claim 36, wherein the bed is operated at a temperature in the range of 20° C and approximately 400° C.

45. The fuel processing system of claim 44, wherein the fuel processing system includes a heating assembly adapted to heat the at least one sulfur-absorbent bed to a temperature in the range of approximately 100° C and approximately 400° C.

46. The fuel processing system of claim 36, wherein the sulfur-removal assembly includes a plurality of sulfur-absorbent beds containing the sulfur-absorbent material.

47. The fuel processing system of claim 46, wherein the sulfur-removal assembly includes a valve assembly that is adapted to selectively deliver the stream containing the carbon-containing feedstock to at least one but less than all of the sulfur-absorbent beds such that at least one of the sulfur-absorbent beds does not receive a portion of the stream containing the carbon-containing feedstock.

48. The fuel processing system of claim 36, wherein each of the sulfur-absorbent beds containing the sulfur-absorbent material has a capacity of absorbed sulfur and further wherein the fuel processing system includes at least one sensor adapted to measure the percentage of the capacity at which each of the beds is operating.

49. The fuel processing system of claim 36, wherein each of the sulfur-absorbent beds containing the sulfur-absorbent material has a capacity of absorbed sulfur, and further wherein the fuel processing system further includes a controller that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has been reached and to trigger a user-notifying event responsive thereto.

50. The fuel processing system of claim 49, wherein upon determination that a bed is operating above the threshold value, the controller is adapted to send a control signal to a user-notifying device.

51. The fuel processing system of claim 49, wherein the controller includes at least one sensor adapted to measure the percentage of each bed's capacity at which the beds are operating.

52. The fuel processing system of claim 51, wherein each of the sulfur-absorbent beds containing the sulfur-absorbent material includes a sensor in communication with the controller and adapted to measure the percentage of the bed's capacity of absorbed sulfur at which the bed is operating.

53. The fuel processing system of claim 49, wherein the controller includes a memory portion in which at least one threshold value is stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material.

54. The fuel processing system of claim 53, wherein the controller includes a memory portion in which at least a lower and a higher threshold value are stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material, and wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device.

55. The fuel processing system of claim 54, wherein the user-notifying device is adapted to produce different responses responsive to receiving the first and the second control signals.

56. The fuel processing system of claim 36, wherein the separation region includes at least one hydrogen-permeable membrane positioned to be contacted by the stream containing hydrogen gas, and further wherein the hydrogen-rich stream is formed from a portion of the stream containing hydrogen gas that permeates through the membrane and the byproduct stream is formed from a portion of the stream containing hydrogen gas that does not pass through the membrane.

57. The fuel processing system of claim 56, wherein the at least one membrane comprises at least one of palladium and a palladium alloy.

58. The fuel processing system of claim 57, wherein the separation region includes a plurality of hydrogen-permeable membranes arranged in pairs such that each pair of membranes defines a permeate channel therebetween from which the hydrogen-rich stream is produced.

59. The fuel processing system of claim 36, further comprising a fuel cell stack adapted to receive at least a portion of the product hydrogen stream and to produce an electric current therefrom.

60. In a steam reformer that is adapted to receive a feed stream comprising water and a carbon-containing feedstock and which includes a reforming region having at least one reforming catalyst bed in which a stream containing hydrogen gas is produced from the feed stream, the improvement comprising: a sulfur-removal assembly comprising at least one sulfur-absorbent bed containing a low temperature shift catalyst upstream from the reforming region and adapted to absorb sulfur-containing compounds from at least a portion of the feed stream prior to delivery to the reforming region.